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EXAMINER

VINH, L

ART UNIT PAPER NUMBER

1765

97

DATE MAILED: 08/24/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

# Office Action Summary

Application No.  
09/002,007

Applicant(s)  
Jeffrey Hung et al.

Examiner  
Lan Vinh

Art Unit  
1765



-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 7/9/01
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11; 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-13 and 16-22 is/are pending in the application.
- 4a) Of the above, claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-13 and 16-22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claims \_\_\_\_\_ are subject to restriction and/or election requirements.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- a) ☐ All b) ☐ Some\* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \*See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

## Attachment(s)

- 15) ☒ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). \_\_\_\_\_
- 18) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other: \_\_\_\_\_

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### DETAILED ACTION

1. The appeal brief filed on 7/9/2001 has been considered. However, the argument presented in the brief is moots in view of the following new ground of rejection.

#### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-4, 6-12, 16-22 are rejected under 35 U.S.C 103(a) as being unpatentable over Abraham ( US 5,980,768) in view of Meador et al ( US 5,919,599 ).

Abraham discloses a method for removing photoresist mask defects in a plasma reactor. This method comprises the steps of etching a photoresist layer 112 covering the organic ARC ( antireflective coating) layer 110 to expose area of the ARC layer on a metallic layer 106 ( col 1, lines 29-56 and fig. 3 ), etching to break through the organic-based ARC using oxidant-free, i.e., substantially no oxygen etching gas source of N<sub>2</sub> in the plasma processing reactor while preserving photoresist layer 112 ( col 7, lines 27-35 and fig. 3 and fig. 5 ) reads on exposing the exposed areas of the organic ARC to an oxygen-free system of etching agent in an ionized state in a reaction chamber.

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Unlike the instant claimed inventions as per claims 1, 11, 22, Abraham does not specifically disclose using an etching agents including fluorine-containing compound (  $\text{CHF}_3$  ), chlorine and an optional inert carrier gas.

However, Meador teaches etching an organic layer using various gases or gases mixture such as oxygen, chlorine,  $\text{CF}_4$ ,  $\text{CHF}_3$ ,  $\text{SF}_6$ , their admixture with nitrogen, Ar and He (inert gases ) ( col 8, lines 10-15 ). That teaching reads on using any of the gas mixture such as a gas mixture/ an etching agents including fluorine-containing compound (  $\text{CHF}_3$  ), chlorine and an optional inert carrier gas to etch an organic material layer.

Since Abraham discloses etching an organic ARC layer and Meador teaches etching an organic layer using the gas mixture as mentioned above, one skilled in the art would have found it obvious to modify Abraham by etching Abraham's organic ARC using a gas mixture as taught by Meador because Meador clearly states that the various gases or gases mixture such as oxygen, chlorine,  $\text{CF}_4$ ,  $\text{CHF}_3$ ,  $\text{SF}_6$ , their admixture with nitrogen, Ar and He (inert gases ) which are known in the art of microlithographic art to be effective for etching organic materials ( col 8, lines 12-14 )

Regarding claim 3, fig. 2 of Abraham shows the ARC layer 110 is exposed by channels forming a circuit pattern based on the resist pattern 112.

Regarding claims 7, 18, 21, Abraham recites keeping the pressure about 15 mTorr within the chamber and the temperature at the bottom electrode at  $30^\circ\text{C}$  ( col 8, lines 23-29 ). That reads on the claimed range of below 40 mtorr or below 100 mTorr.

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Regarding claims 8-9, Abraham discloses the plasma device comprises an ECR reactor and the ARC layer is on a semiconductor wafer ( col 8, lines 8-10 ).

Regarding claim 10, fig . 4 of Abraham shows that the RF energy may be coupled inductively through an antenna outside the chamber to sustain the plasma chamber.

Regarding claims 16, 19, Abraham discloses using polyamide-based organic ARC ( col 1, lines 52-53 )

Regarding claims 17, 20, since Meador teaches etching an organic layer using various gases or gases mixture such as oxygen, chlorine,  $\text{CF}_4$ ,  $\text{CHF}_3$ ,  $\text{SF}_6$ , their admixture with nitrogen, Ar and He (inert gases ), one skilled in the art would have found it obvious to modify Abraham etching step using a gas mixture without nitrogen.

4. Claims 5, 13 are rejected under 35 U.S.C 103(a) as being unpatentable over Abraham ( US 5,980,768) in view of Meador et al. ( US 5,919,599 ) and further in view of the following:

Abraham as modified by Meador has been described above in paragraph 3. Unlike the instant claimed invention as per claims 5, 13, Abraham and Tsai fail to disclose the following aspect of applicant's claimed invention: the specific etchant gases flow rates.

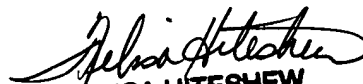
However, it is the examiner's position that one skilled in the art would have found it obvious to employ any of a variety of gas flow rates including those claimed by the applicant because etchant flow rate is a well known variable in the plasma etching art which are known to effect the

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plasma etching process. Further, the selection of particular flow rates would simply involve routine experimentation.

*Conclusion*

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is (703) 305-6302. If attempts to reach the examiner are unsuccessful, the examiner's supervisor, Benjamin Utech, can be reached on (703 ) 308-3836. The official fax number for the organization is (703) 305-3599.

  
FELISA HITESHEW  
PRIMARY EXAMINER

LV

August 22, 2001